What Is Claimed Is:

1.   A method for predicting a plurality of surface multiples for a plurality of target traces in a record of seismic data, comprising:

creating a file containing information regarding a plurality of pairs of recorded traces, wherein each pair of recorded traces is substantially closest to a desired shot-side trace and a desired receiver-side trace;

convolving the pairs of recorded traces to generate a plurality of convolutions; and

stacking the convolutions for each target trace.

2.   The method of claim 1, wherein creating the file containing the information regarding the pairs of recorded traces comprises:

selecting a target trace; and

determining an aperture for the selected target trace.

3.   The method of claim 2, further comprising gridding the aperture into a plurality of cells.

4.   The method of claim 2, wherein the aperture is configured to include substantially all of the potential downward reflection points of the surface multiples for the selected target trace.

5.   The method of claim 2, further comprising selecting a potential downward reflection point for the selected target trace.

6.   The method of claim 5, further comprising computing at least one of a desired shot-side midpoint, offset and azimuth, and at least one of a desired receiver-side midpoint, offset and azimuth based on the selected target trace and the selected potential downward reflection point, wherein the desired shot-side midpoint, offset and azimuth define the desired shot-side trace and the desired receiver-side midpoint, offset and azimuth define the desired receiver-side trace.

7.   The method of claim 5, further determining the pairs of recorded traces for substantially all of the potential downward reflection points of the selected target trace.

8.   The method of claim 6, further determining the pairs of recorded traces.

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9.   The method of claim 8, further comprising storing information regarding the pairs of recorded traces in the file.

10.   The method of claim 8, wherein determining the pairs of recorded traces

10   comprises minimizing an objective function.

11.   The method of claim 1, further comprising dividing the file into one or more subfiles.

15   12.   The method of claim 1, further comprising dividing the file into one or more subfiles according to subsurface line pairs, wherein each pair of recorded traces within each subfile comes from a pair of subsurface lines.

13.   The method of claim 1, further comprising extracting a plurality of recorded

20   traces that correspond to the information regarding the pairs of recorded traces.

14.   The method of claim 13, further comprising correcting the offsets of the extracted recorded traces to an offset of the desired shot-side trace and an offset of the desired receiver-side trace.

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15.   The method of claim 13, further comprising applying a differential moveout correction to the extracted recorded traces to correct the offsets of the extracted recorded traces.

30   16.   The method of claim 1, further comprising sorting the convolutions according to target traces.

17.   A method for predicting a plurality of surface multiples for a plurality of target traces in a record of seismic data, comprising:

(a)   selecting a target trace;

(b)   selecting a potential downward reflection point for the selected target trace;

(c)   computing at least one of a desired shot-side midpoint, offset and azimuth, and at least one of a desired receiver-side midpoint, offset and azimuth using the selected potential downward reflection point and the selected target trace, wherein the desired shot-side midpoint, offset and azimuth define a desired shot-side trace and the desired receiver-side midpoint, offset and azimuth define a desired receiver-side trace;

(d)   determining a pair of recorded traces substantially closest to the desired shot-side trace and to the desired receiver-side trace; and

(e)   convolving the pair of recorded traces to generate a convolution.

18.   The method of claim 17, further comprising creating a file containing information regarding the pair of recorded traces.

19.   The method of claim 17, further comprising repeating steps (a) through (e) for all the potential downward reflections points for each target trace.

20.   The method of claim 19, further comprising stacking a plurality of convolutions for each target trace.